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Product cannibalization and the role of prices

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The role of brand prices in contributing to product cannibalization is examined. Price elasticities and reference price theory are used to provide a theoretical foundation and empirical test for the impact of a firm's cheap brand on one of its expensive brands. Results are consistent with the conclusion that the market share of the company's premium brand was cannibalized by a growth in sales of its cheap brand.

I. INTRODUCTION

The primary objective of this research is to investigate the possible role of a firm's pricing strategy in contributing to cannibalization between two brands in its product portfolio. Specifically, the company's premium brand of beer suffered a sales loss in just under one year with a market share decrease running well into double digits. The drop was caused by losses to other brands – most notably to another cheaper brand the brewery also maintained in its product portfolio. Given the decline of the high margin premium product and the coincidental increase in market share of one of the firm's cheaper low margin 'fighting brands', cannibalization was suspected.

A second objective is to develop a simple analytical template that might prove useful as an 'early warning' system to managers who are concerned that a potential cannibalization problem may be developing between brands in their product portfolio.

The emergence of a substantial price spread between the company's premium brand and its cheap brand are of particular interest in this research. This is because the literature does not appear to deal with the role of price gaps *per se* and the effect these could have on the inducement of cannibalization between brands.

A review of the literature leads to a number of distinct streams of research that are of interest. Cannibalization, price elasticities, and reference price theory are all germane to this study.

II. PREVIOUS RESEARCH

Mason and Milne (1994) stated that 'With the exception of new product models there is little research on product cannibalization' (Mason and Milne, 1994: 163). A subsequent electronic literature search appears to support their contention.

In their pairwise study of on-going cannibalization among cigarette brands Mason and Milne (1994) introduced the notion of core (versus fringe) customers who make up particular brand niches. This distinction is useful because it focuses attention on the fact that brands attract some buyers who are relatively loyal (core customers) while others on the fringe of a brand's niche will be more likely to switch to alternative brands given an appropriate incentive such as a promotional price reduction. Another key aspect of their study relates to the notion of asymmetric cross-price elasticities between brand substitutes. The implication for this study is that brand 'A' for example, may be in a better position to cannibalize the market share of its substitute, brand 'B', than vice versa.

An earlier cannibalization article by Harvey and Kerin (1979) on the diagnosis and management of cannibalization is also relevant to this research. They suggested that the greater the similarity between product attributes the greater will be the likelihood that a new product will draw sales from a competing product or cannibalize the sales of an existing one. This is important because it leads to the suggestion that brands that are considered

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very similar by consumers should be more susceptible to switching. If the attributes are highly similar (as often occurs among homogeneous packaged products like beer, detergent or cigarettes for example) then it becomes easier for the brand which is price discounted to cannibalize share from its similar but more expensive counterpart in the firm's product portfolio.

Nadler (1997) and Child *et al.* (1991) note the importance of cannibalization in management decision making. Both authors comment on the seriousness of the problem in the context of deciding when cannibalization among brands in a firm's product portfolio must be tolerated because of substitution threats from competitors. The argument hinges on the issue of deliberately allowing a 'strong' brand to cannibalize the sales of a vulnerable brand within the firm's product portfolio rather than letting a competitor erode the sales of the vulnerable brand. The underlying rationale is that it is better for the firm to 'trade market share' among brands within its own product portfolio than to let competitors steal market share from the company's vulnerable brand.

Unlike the area of cannibalization, a great deal of research using elasticity estimates has been conducted over the last 40 years. Tellis (1988) provides a useful summary and meta-analysis of these earlier studies. He examined 367 price elasticities linking selective sales and/or market share data to brand prices. Most important among his findings was the conclusion that price elasticity was significantly negative and in absolute value, eight times larger than the advertising elasticity results found in an earlier meta-analysis. His conclusions serve to focus attention on the impact of price sensitivity as a determinant of selective sales and/or brand market shares.

Cooper (1988) used asymmetric cross-price elasticities to examine competitive maps. Of particular interest are his elasticity results that show some brands exercising competitive 'clout' while others are identified as 'receptive' or 'vulnerable' to attack by competing brands. This is consistent with the cannibalization phenomenon in that some brands are argued to acquire their market share growth through the erosion of sales belonging to another brand that is vulnerable to price discounting or other marketing efforts undertaken by the firm – or for that matter – competitors.

Blattberg and Wisniewski (1989) also worked with asymmetric price elasticities. They examined the price-induced patterns of competition among four grocery items where the product features (excluding quality) were basically homogeneous. Only price and the implied linkage to quality varied. Empirical results of their study led to a number of conclusions that are relevant to the issue of cannibalization. They found an asymmetric pattern of price competition based on price/quality tiers. In those situations where high priced/high quality brands were discounted, they tended to take market share from other brands considered to be in the same price/quality tier and from brands in the next price/quality tier below. Blattberg and Wisniewski (1989) also stated however that 'Bimodal preference distributions do not rule out a lower-tier brand affecting an upper-tier brand. Such a result suggests that either the differences in quality are closer than for other across-tier pairs of brands or the price of the lower brand is being reduced sufficiently to offset the loss in utility from switching from the higher tier brand to the lower brand for some of the customers in the market' (Blattberg and Wisniewski, 1989: 304). They also speculated that if the cheaper private label and/or generic brands were to increase the depth of their price dealing in two of the four grocery products, 'significant cross-price effects with the national brands might be found' (p. 305).

With regard to the mechanism of cannibalization examined in this research, the Blattberg and Wisniewski (1989) results suggest that the market may treat price tiers as separate niches associated with various implied levels of quality. These price/quality levels serve to define the various brands that belong to a particular price tier – and those that do not. However, if price discounts are extreme enough in the lower tier products to compensate for what some consumers consider to be the associated lower quality, the market share of the upper tier brands could be threatened. This scenario would certainly be consistent with the phenomenon of a cheap brand cannibalizing an expensive brand.

As with price elasticity estimates, a great deal of research has been done on the role of reference prices and the theoretics that underlie them – Kalyanaram and Winer (1992) provide a useful summary of these articles. The research underlying temporally based reference prices may offer a number of important implications for cannibalization and how it is triggered. For example, Helson's Adaptation-Level Theory (1964) together with Kahneman and Taversky's (1979) Prospect Theory and research by Johnson and Meyer (1994), suggests that consumers use their experiences of past and present price levels to form a temporally based reference price. Any new price which is subsequently observed will then be compared to the reference price which serves as a benchmark for evaluation. Through this comparison, consumers then determine whether the new price represents a 'gain' (because the actual observed price is less than their reference price) or a 'loss' because it is greater than their reference price. Carrying reference price theory to the issue of cannibalization suggests by analogy that consumers may well come to expect a normal or 'reference price spread' between a firm's premium price brand and its cheaper brand(s). Should that price spread increase beyond the historical range to which the consumers have become accustomed, brand switching from the premium to the cheap brand may be triggered – especially if clearly discernable attribute differences such as

levels of quality are not readily apparent between the expensive brand and the cheap brand.

Putler (1992) took the reference price issue one step further with his conclusion that not only did reference prices influence consumer behaviour but that because of 'loss aversion' they responded two and a half times more to a price increase above the reference price of eggs (hence a perceived loss) than they did to a price decrease (a perceived gain), i.e. responses to perceived losses and gains were asymmetric. If Putler's conclusions can be generalized, a price increase of the premium brand, because of temporal reference price effects may exacerbate the cannibalization problem.

The Assimilation-Contrast Theory ascribed to Sherif and Hovland (1958) also offers insight into the cannibalization problem. These authors proposed that consumers psychologically establish a range of acceptable prices. If an observed a new price falls within the pre-established range it is assimilated as being appropriate. If the price falls outside of the acceptable range however, it attracts attention when it is compared to the predetermined acceptable range. Again by analogy, it is possible that consumers may view the price spread between the premium and cheap brands as falling within an acceptable range. If the price spread should subsequently violate that acceptable range by exceeding it, the new price spread might then attract attention as being too big to ignore. The result could again trigger cannibalization with the cheaper brand receiving consideration as a possible substitute for the expensive brand. The rationale for this behaviour might be linked back to the conclusions of Blattberg and Wisniewski (1989), i.e. if the price difference between two brands becomes large enough some consumers may decide to trade off the utility of the high quality (and high priced) brand for the lower quality but lower priced brand.

Finally, it should be noted that temporal reference price effects in the literature are often modelled by using exponentially smoothed values of the brand's previous prices. For example, see Kopalle *et al.* (1996), Greenleaf (1995), Kalwani *et al.* (1990), Krishnamurthi *et al.* (1992), Putler (1992) and Winer (1985, 1986).

Rajendran and Tellis (1994) expanded the literature by introducing contextual prices as an alternative explanation to temporal reference price theory. They argued that in addition to considering past prices of a brand, consumers also compare the prices of other competing brands in the product category. Their empirical results led to the conclusions that 'The contextual component is at least as strong as the temporal component in general, but it is stronger when brand preference is weaker, brand sampling is wider, and shopping is infrequent' (Rajendran and Tellis, 1994: 33). They concluded that 'The low-priced brand tested as the most important measure for the contextual reference price' (p. 33). It is interesting to note that Biswas and Blair (1991) in a study of reference prices and retail advertisements, also concluded 'We believe though that the more important belief for patronage is the consumer's belief about how a sale price compares with the *lowest price in the market area* (our empirical results seem to confirm this point . . .)' (p. 3, emphasis added).

Contextual price effects may provide a major explanation for the ability of a low priced brand to cannibalize a high priced brand. If low priced brands contribute to consumer perceptions that are used to evaluate the prices of other brands in the same product category, it is feasible that they could also lead to a conclusion among consumers that a premium brand (given its price/quality attributes) was comparatively over-priced relative to cheaper brands. This contextual effect could conceivably lead some buyers to consider lower-priced substitutes. Because of contextual effects the price spread might again be viewed as being too big to ignore, thus triggering cannibalization.

In summary temporal, contextual, or some combination of the two effects could play a significant role in contributing to a sufficiently large price spread between the firm's premium brand and its cheap brand. If the price gap were large enough, it might induce brand cannibalization.

III. ANTECEDENTS OF CANNIBALIZATION

For purposes of this analysis, the premium brand whose market share is cannibalized will also be referred to as the victim brand. Conversely, the cheaper brand will be referred to as the attacking or cannibalizing brand. This is because the sales increase of the attacking brand comes mainly at the expense of the cannibalized market share taken from the victim (premium) brand. Reference will also be made to upward cannibalization in which a lower price/quality brand takes market share from a higher ranked victim brand and downward cannibalization where a higher ranked price/quality brand takes market share from a lower ranked brand. This distinction is made because the margins associated with premium brands often differ from those of cheap or 'fighting' brands. The direction of the cannibalization may consequently have serious implications for the profitability of firm's product portfolio.

A number of conditions should exist in order for cannibalization to occur. While they need not all occur simultaneously, it is suggested that the cannibalization effect could be exacerbated by their collective presence.

Buyers should perceive little variation in brand 'quality' or differences in attributes between the attacking brand and the victim brand that will subsequently be cannibalized. (The definition of quality used here is considered to be consistent with that of Blattberg and Wisniewski (1989)

and of Moorthy and Eng (1992).[1]) This condition should be particularly germane in upward cannibalization (a cheap brand cannibalizes a premium brand). The lack of perceived quality differences between the brands should make the premium product more vulnerable to contextual price comparison with its cheaper brand substitute.

Alternatively, buyers may simply have little utility for the particular attributes that are used to differentiate the attacking and victim brands. In this case, while there may exist discernable differences in 'quality' between the brands, it is suggested that some consumers simply do not have a high utility for it. The result may be increased attention to the importance of brand prices (and the price spread between them) at the expense of the brands' other differentiating attributes.

The size of the price spread between the premium brand and the cheap brand should be sufficiently large to trigger demand shifts. If buyers perceive the premium and cheap brands to be even somewhat comparable with regard to the attributes that each offers, then, given the opening of a sufficiently large price spread between the two, cannibalization may occur because some consumers no longer feel the attributes of the premium brand justify its premium price (relative to the cheap brand).

An opposite effect may result in downward cannibalization when the price spread decreases between the premium and the low priced brand. As the price spread narrows, an incentive to move to the premium brand may emerge. This is because the buyer might perceive the price spread between the brands as being small enough to rationalize switching to the premium brand with its associated superior quality. This result would be consistent with Blattberg and Wisniewski's (1989) findings of price discounted national brands stealing market share from lower priced brands.

The relationship between a brand's price and its quality should also play an important role in the process of cannibalization. In particular, it is suggested that there exists a price/quality continuum which consumers use to evaluate brands. The price/quality linkage is not new. Scitovsky (1945: 100) remarked that 'more often than not people judge quality by price'. Similarly, Blattberg and Wisniewski (1989) introduced the notion of 'price/quality tiers' which they suggest consumers use to help classify brands. Variations in either a brand's price or its quality can cause shifts in where consumers perceive it to be located on the continuum. Similarly, a change in the price or quality of a competing product against which the brand is judged can also affect where it is located on the continuum.

IV. HYPOTHESES

The following hypotheses are based on the previous discussion. They are intended to address the issues of cannibalization only as they relate to the data analysed in this study, i.e. because the data in Fig. 1 make it apparent that the premium brand suffered while the market share of the cheap brand increased dramatically, the hypotheses focus on the possible existence of upward and not downward, cannibalization.

- H_1 Upward cannibalization of the firm's premium brand by its cheaper brand is positively related to the temporal loss created by the price increase of the premium brand.
- H_2 Upward cannibalization of the firm's premium brand by its cheaper brand is positively related to the contextual price spread between the victim and the attacking brand, i.e. the larger the price spread that exists between the victim and the attacking brand, the greater the potential for cannibalization of the victim brand.
- H_3 Upward cannibalization of the firm's premium brand will be more susceptible to contextual effects arising directly from price comparisons to its cheaper brand than from temporal effects which require recollection of prior premium brand prices.

V. DATA ANALYSIS

Figure 1 is provided to aid in substantiating the previous discussion and to lay a foundation for specification of the regression equations that follow. Perhaps more importantly, it will also be used to provide the basis of a simple analytical template that managers can use as an 'early warning' detection system when they are concerned about the onset of possible cannibalization.

In the diagram, the two brand market share for brand 'B' (MSB) is plotted against the price premium of brand 'A' over brand 'B' (PPA). This allows the comparison of price and sales data for both the attacking and victim brands in percentage based terms on the same graph. Over the first 30 monthly observations it is apparent that the price premium of brand 'A' over 'B' was constant in the 1–10% range while the corresponding two brand market share of brand 'B' was relatively constant in the region of 10–12%. Of particular interest however, is the sudden increase in the price premium of brand 'A' and the corresponding gain in the market share of brand 'B' that occurs around the 30th month. Observations 40 through 45 are also of

[1] In their study, Blattberg and Wisniewski (1989: 293) defined quality as '... a summary measure denoting a brand's overall attractiveness, exclusive of price. As such, quality is an overall preference for a particular occasion that summarizes multidimensional consumer product perceptions or attributes exclusive of price'. Moorthy and Eng (1992: 346) defined quality as 'a dimension on which consumers agree in their preference, ordering, *ceteris paribus*, for example engine power or gas mileage in the case of cars'.

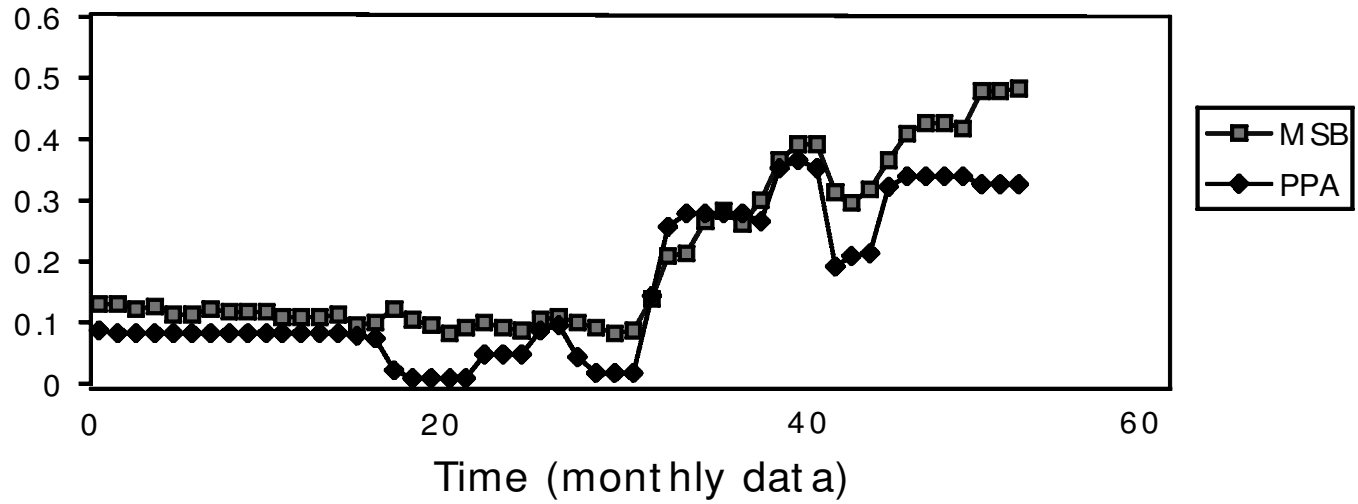

Fig. 1. *Market share and price premium* (*MSB = market share of brand 'B', PPA = price premium of brand 'A' over brand B'*)

interest in that a decrease in the price premium of brand 'A' appears to be associated with a loss in the two brand market share of brand 'B''. Finally, between months 45 and 51, while the price of brand 'A' appears to have stabilized at approximately 130% of the cheaper brand 'B', the market share of 'B' continues to post gains at the expense of the premium brand 'A'.

While Fig. 1 shows the price spread between the victim and the attacking brands, it should be noted that the actual contributing causes to the spread were mainly due to the pricing patterns of brand 'B'. Over the 51 month time period in the sample, the brand 'A' price increased on a relatively steady basis. Mid-way through the same time period however, brand 'B' decreased substantially.

The regression analysis used in this study is based on price and sales volume data applicable to a regional market for bottled and canned beer. Regrettably, neither the company, the brands involved, nor the regional market under consideration can be divulged for reasons of confidentiality. Fifty-one monthly observations covering the prices and volumes of two brands belonging to the brewery were used in the estimations reported here.

This study is limited by a number of restrictions, namely, the database that was examined. First, because the pattern of the sales shifts between the brands made it clear that the company's premium beer was indeed the victim brand, it is not possible to examine the Blattberg and Wisniewski (1989) scenario in which the premium brand cannibalizes the market share of the cheaper brand(s). Second, while detailed price information by brand was available for competitors, only aggregate total sales of competitors' were available. It was thus impossible to construct a weighted average price for competitors. A market share variable using the sales volume of the attacking brand ratioed to the sum of the sales volumes of the victim brand plus the attacking brand was employed. The result was a restricted market share variable based on the brewery's two brands. This was done because a plot of the two brands' sales volumes and prices produced preliminary evidence indicating cannibalization was a distinct possibility (see Fig. 1). Third, this study also uses aggregated market level data. Ideally, household level data would have been preferred because they allow for heterogeneous responses in consumer purchasing behaviour. Monthly data can also lead to bias because they mask weekly price response patterns. Finally, this research does not include data on some possible confounding effects that might have biased the observed price elasticities of the victim and attacking brands. For example, advertising revenues were not available. Throughout the time period under consideration however no major advertising campaigns were introduced by the firm nor its competitors. Neither were any new products introduced that might have eroded the share of the victim brand. Competitors' prices which could have produced severe bias were fortunately available and examined in some detail.

Ideally, estimation procedures for cannibalization should rely on store based scanner data for individual brands, cross-referenced with specific household based data. In reality of course this information is not always available because of prohibitive cost, time taken to collect sufficient information, availability of scanner technology, and the proficiency of managers in conducting statistical analysis.

A number of specifications were examined. The equations used variables in a logged format since Box–Cox tests indicated this was the appropriate specification structure. The likelihood ratio test statistic supporting the hypothesis that the specification was linear was 50.86. The hypothesis that it should be specified in a double log format was 2.74 (both distributed as Chi square distributions with one degree of freedom).

The equations were also tested for serial correlation. Durbin–Watson results clearly indicated that adjustments for autocorrelation were required. Cochrane–Orcutt corrections consistently moved Durbin–Watson scores from the 0.68–1.14 range into a more acceptable (approximately 1.9–2.1) region.

Equation 1 tests for contextual effects through examination of the current period prices for brand 'A' (the premium or victim brand) and brand 'B' (the cheap or attacking brand). The price difference in brand 'B' over the time periods t and $t-1$ was also examined to see if it exerted any temporal effects (expected signs are indicated in equations)

$$LMSB_t = \alpha + \beta_1 LPA_t - \beta_2 LPB_t - \beta_3 DLPB + e \qquad (1)$$

Where: $LMSB_t = \log$ [sales of brand 'B' in time t/(sales of brand 'A' in time t + sales of brand 'B' in time t)]; $\beta_1 LPA_t =$ log of price of brand 'A' in time t: $\beta_2 LPB_t =$ log of price of brand 'B' in time t; $\beta_3 DLPB = (LPB_t - LPB_{t-1}) =$ difference between the logged price of brand 'B' in time t and the logged price in time $t-1$; $e =$ residuals (error term).

Equation 2 used variables in a logarithmic format as well except that the price spread approach used in Equation 1 was replaced with a system that used one period lagged prices (in addition to current prices) for both the premium brand and cheap brand. Compared to the previous specification, Equation 2 is closer to that used in the reference price literature.

$$LMSB_t = \alpha + \beta_1 LPA_t + \beta_2 LPA_{t-1} - \beta_3 LPB_t - \beta_4 LPB_{t-1} + e \qquad (2)$$

Where $LMSB_t = \log$ [sales of brand 'B' in time t/(sales of brand 'B' in time t + sales of brand 'A' in time t)]; $\beta_1 LPA_t = \log$ of price of brand 'A' in time t; $\beta_2 LPA_{t-1} =$ log of price of brand 'A' in time $t-1$; $\beta_3 LPB_t = \log$ of price of brand 'B' in time t; $\beta_4 LPB_{t-1} = \log$ of price of brand 'B' in time $t-1$; $e =$ residuals (error term).

Equation 3 is similar to Equation 2 with the exception of adding a new independent variable. Each of the observations in *LMINP* represents the minimum monthly price (based on all the brands) of a case of beer trading in the market area. (It should be noted that brand 'B' consistently failed to qualify as the cheapest brand in the trading area. Consequently, *LMINP* is uncontaminated by any price observations from brand 'B').

The variable is based on the findings of Rajendran and Tellis (1994: 33) and Biswas and Blair (1991). Recall that these works focused on the importance of the lowest priced brand or the lowest price available in the trading area as a

Table 1. *Dependent variable = LMSB (logged market share of brand 'B')*

	Constant	LPA_t	LPB_t	$DLPB$	LPA_{t-1}	LPB_{t-1}	$LMINP_t$
Mean		6.28	6.14	0.12			6.05
Standard Deviation		0.11	0.09	0.84			0.78
Equation 1							
Coefficients	−12.86	4.31	−2.58	0.01			
t-values	(−2.95)[b]	(5.77)[a]	(−6.76)[a]	(0.71)			
$R^2 = 0.98$ Rho = 0.95 D.W. = 1.95							
Equation 2							
Coefficients	−11.83	3.87	−2.40		0.87	−0.80	
t-values	(−2.40)[b]	(4.91)[a]	(−6.17)[a]		(1.14)	(−2.01)[b]	
$R^2 = 0.98$ Rho = 0.95 D.W. = 2.00							
t-values for sum of lag coefficients:							
$LPA_t + LPA_{t-1} = 5.78$							
$LPB_t + LPB_{t-1} = -6.69$							
Equation 3							
Coefficients	−12.78	3.55	−2.95		0.82	−0.87	1.17
t-values	(−2.61)[a]	(4.42)[a]	(−5.74)[a]		(1.09)	(−2.21)[b]	(1.59)[c]
$R^2 = 0.98$ Rho = 0.95 D.W. = 2.06							
t-values for sum of coefficients:							
$LPA_t + LPA_{t-1} = 5.19$							
$LPB_t + LPB_{t-1} = -6.26$							

Note: Student's *t*-value one tailed test.
[a] significant at 1%; [b] significant at 5%; [c] significant at 10%.

benchmark against which contextual reference prices are judged by consumers.

$LMINP_t$ is used in the context of this research to test the robustness of the cheap brand (brand 'B') as an explanatory variable in accounting for the cannibalization of the premium brand. It is suggested here, that if the cheap brand 'B' could erode the market share of the premium brand then so could other comparable low priced substitutes. Entering the price vector of brand 'B' along with that of $LMINP_t$ should allow a comparison of which variable's prices correlate best with the market share growth of brand 'B' at the expense of the market share loss suffered by the premium brand ('A').

VI. STATISTICAL RESULTS

In Equation 1, the current period prices of brands 'A' and 'B' show the appropriate signs. The impact of brand 'A' prices on the market share of brand 'B' is positive and significant well within the 1% region. This leads to the suggestion that contextual price comparisons between the cheap and premium brands may indeed be contributing to market share gains for brand 'B' at the expense of brand 'A''. The sign of LPB_t shows a strong negative relationship to the market share of brand 'B' correctly suggesting that 'own price' has a negative impact on market share.

The variable DLPB was intended to capture temporal effects since its configuration was based on the price spread occurring between periods t and $t-1$. The variable exhibits an incorrect sign with a very small t-value. A number of factors could be driving this result. First, it should be noted that young males between 18 and 30 years of age constituted the main segment purchasing the types of beer examined in this study. Arguably, this segment may not be as aware of temporal price movements as would home makers who regularly buy grocery items for example.

Another artefact of this study relates to the shelf positioning of the brands. In the market area and time period of concern, the various brands of a given brewery were located in direct proximity to each other since that is how the palletized brands were shipped to the distribution outlets. This shelf positioning may have played a significant role in encouraging contextual price comparisons between the brewery's cheapest brand and their most expensive. (It should be noted that the practice of positioning their cheap brand beside their premium brand was subsequently halted.)

Equation 2 focuses on the role of current and lagged (one period) prices in determining the market share for brand 'B'. Again, the role of current prices for brands 'A' and 'B' are correctly signed and quite robust. The one period lagged price proxying the temporal effect (LPB_{t-1}) is significant at the 5% level. LPA_{t-1} while carrying the right sign failed to reach significance at the 10% level. The coefficients of these lagged terms can be interpreted as part of the respective cross-price (LPA_{t-1}) and own price (LPB_{t-1}) elasticities. It is interesting therefore, to consider the sum of the current and lagged coefficients as well as their t-values.

Brand A $\quad LPA_t + LPA_{t-1} = 4.75(5.78)$

Brand B $\quad LPB_t + LPB_{t-1} = -3.20(-6.69)$

Equation 3 again uses both current and lagged prices as determinants of brand 'B' market share. For current and lagged prices, results are consistent with those of Equation 2. Also included however is an independent variable ($LMINP_t$) designed to test the hypothesis that other low priced brands in the market area were in fact the primary cause of market share loss for brand 'A'. $LMINP_t$ is significant only at the 10% level. For comparison, note that the sum of t-values for both the current and lagged price coefficients of brand 'B' is 6.26 – well within the 0.05% range.

Other specifications were also examined in attempt to identify temporal effects. A number of different moving average measures that were based on a composite of past brand prices were tested. None of the results supported evidence of temporal effects.

The use of past brand price averages in the evaluation of temporal effects is both supported as well as contradicted by evidence in the literature. Rajendran and Tellis (1994), reported that most of the choice models they examined based reference prices on some average of past brand prices.

Evidence from Jacobson and Obermiller (1990), Gupta (1988) and Blattberg and Wisniewski (1989) however, indicates that consumers may make greater use of interbrand comparisons than they do of intertemporal price comparisons. As mentioned previously, given the nature of the target market (young males) and the product of interest, perhaps the absence of clearly identifiable temporal effects should not be totally unexpected.

VII. MANAGEMENT IMPLICATIONS

A template that may be helpful in the early detection of cannibalization can be developed based on Fig. 1. The analytical steps correspond to the following.

1. The most easily identified problem and therefore the starting point of the diagnosis is the decline in sales or market share of a brand in the firm's product portfolio.
2. If cannibalization is suspected the sales volume of the potential attacking brand is reviewed and compared to that of the suspected victim brand. The pattern of data relating the two, and that which should cause

further investigation is one where the decreased sales of the victim brand are mirrored by increasing sales of the suspected attacking brand.

3. The prices of the attacking and victim brands are similarly compared in order to determine if a significant change has occurred in either of them such that their historical price spread has been altered.
4. If a significant change in the price spread between the suspected victim and attacking brands has occurred, this information is temporally compared to the time frame where the first noticeable changes in the market shares of the two brands developed. As the change in the price spread takes hold, so too does the increase in the market share of the attacking brand while that of the victim brand proportionately decreases.
5. If upward cannibalization is suspected (a low priced brand erodes sales of a higher priced brand) an increase in the price spread between the two may be the cause. If downward cannibalization is suspected a significant closing of the historical price gap between the two brands should be considered as the cause.

Other forms of analysis including brand switching probabilities and the use of disaggregated scanner data can be used to confirm cannibalization. The preceding template is offered because managers often need to react quickly and do not enjoy the luxury of waiting to acquire a sufficient amount of price and sales data or the development of complex analytical models before undertaking analysis. The template is intended to provide circumstantial evidence that cannibalization may be afoot and to alert management to the need for further investigation.

A number of other management implications arise from this research. Brand managers might be prudent to think not only about the absolute prices of their individual brands but also about the relative price spreads that exist between the various brands in the firm's product portfolio. This suggests a more 'collective' (as opposed to an independent or profit centre) approach in setting individual brand prices. While consumer products manufacturers are becoming more sensitive to this problem, experience indicates that industrial marketers clearly have room for improvement. The size of the price spread between brands can be expected to increase in importance as the degree of substitutability between brands increases and as the level of buyer indifference, regarding, brand attributes increases. Managers should also be wary of the exacerbated cannibalization effects that can potentially arise when a temporally based price spread is compounded by a contextual price spread as well. In those situations where managers wish to avoid cannibalization problems due to a relative price disadvantage of the victim brand, it may be possible to augment its competitive position by increasing advertising support. The objective of this strategy would be to make demand for the victim brand less price elastic and less subject to substitution by the attacking brand. The dynamic effects of price spreads on cannibalization are not well understood. Once cannibalization has begun, the difficulty of halting the process may be more problematic than simply removing the price spread between the victim and attacking brands. In Fig. 1, it should be noted that once brand 'B' had begun to grow at the expense of brand 'A', management's reduction of the brand 'A' price premium did not produce a proportionate drop in the market share growth of brand 'B'. i.e., the impact of an increase in the price spread (versus a decrease) on the cannibalization process may be asymmetric depending on whether cannibalization is just beginning or whether it has already gained a momentum of its own.

In some instances cannibalization is of course necessary and even planned for in corporate strategies. In other cases however it occurs inadvertently and can result in high margin products being cannibalized by cheaper brands. The objective of this research was to address the issue of accidental cannibalization because the problem can be expected to be get worse – not better. The reasons for this can be found both in brand proliferation as well as the increased complexity of monitoring multi-division global enterprises where manufacturing, markets and competition often overlap.

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